J Nanomater Mol Nanotechnol 2018, Volume 7
DOI: 10.4172/2324-8777-C11-051

2nd International Conference on
Nanostructured Materials & Nanochemistry
November 02-03, 2018 | San Francisco, USA

Lipid-polymer hybrid nanoparticles versatile platform for controlled delivery of chemotherapeutics

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Lipid polymer hybrid nanoparticles (LPHNPs) for the controlled delivery of hydrophilic doxorubicin hydrochloride (DOX.HCl) and lipophilic DOX base have been fabricated by the single step modified nanoprecipitation method. Poly (D, L-lactide-co-glycolide) (PLGA), lecithin and 1,2-distearoyl-Sn-glycero-3-phosphoethanolamine-N-[methoxy (polyethylene glycol)-2000 (DSPE-PEG 2000) were selected as structural components. The mean particle size was 173–208nm, an encapsulation efficiency of 17.8±1.9 to 43.8±4.4% and 40.3±0.6 to 59. 8±1.4% for DOX.HCl and DOX base, respectively. The drug release profile was in the range 33–57% in 24h and follow the Higuchi model (R2=0.9867–0.9450) and Fickian diffusion (n<0.5). However, the release of DOX base was slower than DOX.HCl. The *in vitro* cytotoxicity studies and confocal imaging showed safety, good biocompatibility and a higher degree of particle internalization. The higher internalization of DOX base was attributed to higher permeability of lipophilic component and better hydrophobic interaction of particles with cell membranes. Compared to the free DOX, the DOX.HCl and DOX base loaded LPHNPs showed higher antiproliferation effects in MDA-MB231 and PC3 cells. Therefore, LPHNPs have provided a potential drug delivery strategy for safe, controlled delivery of both hydrophilic and lipophilic form of DOX in cancer cells.

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